Estimating the Number of Pregnant Women in a Geographic Area

A Reproductive Health Tool

This document describes an approach to estimate the number of pregnant women in a United States (U.S.) geographic area at any given point-in-time and provides example calculations. Calculations can be performed using our Microsoft Excel tool, accessible at https://www.cdc.gov/reproductive-health/media/files/Pregnant-Population-Size-Estimator-Tool-508.xlsx. Pregnant and postpartum women are classified as a population with special clinical needs in the 2019 Pandemic and All-Hazards Preparedness and Advancing Innovation Act.[1] Knowing the approximate number of pregnant women within an area can inform emergency planning and response to better address the special needs of this population.

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The Estimation Process

We describe an equation that can be used to estimate the number of pregnant women in a U.S. geographic area at a point-in-time. Before beginning the estimation process, it may be helpful to contact the Maternal Child Health (MCH) Director or the MCH point of contact for your geographic area of interest. These individuals may be able to provide additional information that may assist with the estimation process.

To estimate the number of pregnant women in a geographic area at a point-in-time, three pieces of information are needed:

1) the geographic area of interest (e.g., counties, cities, census tracts, etc.)
2) the total number of women of reproductive age (WRA), 15-49 years, in the geographic area
3) annual number or rate of pregnancy outcomes in the area

This information can be accessed through the online databases described below.

Geographic area of interest: The geographic area of interest used in this calculation may vary depending on the purpose of your calculation – preparedness planning or emergency response. For preparedness planning, a local jurisdiction, such as a city or county, is typically used as the geographic area of interest. In an emergency response, the geographic area of interest is likely the disaster-affected area as defined by the Federal Emergency Management Agency (FEMA). Geographic information system (GIS) mapping may be helpful to visualize the geographic area of interest. Resources are available through the FEMA Enterprise GIS Service, the U.S. Geological Survey National Map Downloader, and the U.S. Census Bureau Cartographic Boundary Files.

Number of women of reproductive age: The second piece of information is the number of WRA, 15-49 years, within the geographic area of interest. This can be obtained through the U.S. Census Bureau and American Community Survey.

Pregnancy outcomes: The third piece of information, pregnancy outcomes, includes live births, induced abortions, and pregnancy losses.[2]

- **Live births:** Live births may be reported as an annual total or as a fertility rate. Data are publicly available for geographic areas at the county level and above with a population of 100,000 or more through NVSS and CDC WONDER. The most current fertility rates are one or more years behind the current year. March of Dimes Peristats offers 3-year live birth summaries for most counties in the U.S.
- **Induced abortions**: National and state level data on induced abortions are available from the Centers for Disease Control and Prevention (CDC) Abortion Surveillance System and the Guttmacher Institute.
- **Pregnancy losses:** Early pregnancy losses occurring before 20 weeks gestation may be called spontaneous pregnancy losses or miscarriages, and late losses occurring at or after 20 weeks gestation may be called stillbirths, fetal losses, or fetal deaths.[3] Most states and national data only report losses occurring at 20 weeks gestation or more.[2] We recommend using the most recent local data available, or state data from the National Vital Statistics System (NVSS) and CDC WONDER. As data on losses occurring before 20 weeks can be difficult to obtain, a ratio of early fetal losses to live births can be used in this estimation.

Most pregnancy outcome data are reported annually; therefore, the equation adjusts the annual values to reflect the proportion of a 52-week year that a pregnancy ending in the respective outcome lasts. For more detailed information on how the values for this equation were determined, see the appendix.

Calculation of Estimated Number of Pregnant People

Once the required input data are obtained (i.e., number of live births, induced abortions, early losses, and late losses), the calculation for a point-in-time estimate of pregnant women in a geographic area can be determined using the equation below.

Input Data

Values that must be obtained by the user, and input to the equation to determine the estimated number of pregnant women in the geographic area of interest at a point-in-time.

NB = annual number of live births
NA = annual number of induced abortions
NM = annual number of early losses (<20 weeks)
When unavailable use, **NM**= 0.26***NB**
NS = annual number of late losses (≥20 weeks)

Constants

P = proportion of the year (52-weeks) a woman is pregnant for each pregnancy outcome
$\mathbf{P}_B$: 0.75 for a live birth
$\mathbf{P}_A$: 0.12 for an induced abortion
$\mathbf{P}_M$: 0.14 for an early loss (<20 weeks)
$\mathbf{P}_S$: 0.52 for a late loss (≥20 weeks)

Equation

Equation one can be used to estimate the number of pregnant women in a geographic area of interest at a point-in-time.

$$(\mathbf{P}_B * \mathbf{NB}) + (\mathbf{P}_A * \mathbf{NA}) + (\mathbf{P}_M * \mathbf{NM}) + (\mathbf{P}_S * \mathbf{NS}) \quad \textbf{(1)}$$

Converting a Rate to a Number

The fertility rate can be converted to the annual number of live births, or the induced abortion rate can be converted to the annual number of induced abortions, when the number of WRA are known.

Variables

WRA = number of women of reproductive age (15-49 years) in geographic area corresponding to rate
Rate = fertility or induced abortion rate reported per 1,000 WRA
Number = the annual number of pregnancy outcomes corresponding to the rate entered (e.g., annual live births from fertility rate; annual induced abortions from induced abortion rate)

Equation

Equation two can be used to convert a rate (per 1,000 WRA) to an annual number.

$$\frac{\mathbf{WRA} * \mathbf{Rate}}{\mathbf{1,000}} = \mathbf{Number} \quad \textbf{(2)}$$

Note: The fertility rate or induced abortion rate may only be available for women 15-44 years instead of 15-49 years. The same equation can be used. Modify the number of WRA to include the same age range as the rate used.

Examples

Using these equations and publicly available data (American Community Survey, Vital Statistics through CDC WONDER, and CDC Abortion Surveillance), two examples below illustrate how this tool can be used to estimate the number of pregnant women in a geographic area at a point-in-time. A third example illustrates how a rate can be converted to an annual number. These examples can also be found in the Microsoft Excel tool on the tabs labelled "Example".

Example 1 – Georgia

In Georgia, there were 123,966 annual live births (NB) in 2021.[4] Among Georgia residents in 2021, there were approximately 36,975 induced abortions (NA).[5] In 2021, Georgia reported 1,004 late losses (NS).[6] The number of early losses (NM) was unavailable, so a ratio of 0.26 of live births was used. Equation one was applied.

$$(0.75 * 123{,}966) + (0.12 * 36{,}975) + [0.14\ (0.26 * 123{,}966)] + (0.52 * 1{,}004) = 102{,}446$$

In 2021, approximately 102,446 women were pregnant at any point-in-time in Georgia.

Example 2 – Barrow County, GA

From Example 1, approximately 102,446 women were pregnant at any point-in-time in Georgia in 2021. When the pregnancy outcome annual numbers and rates are not available for the geographic area of interest, but the number of WRA in the area of interest is known, then a proportion of WRA can be applied to the state estimate. This assumes the given geographic area of interest is within the state (e.g., county, city, town) and the outcome has a similar distribution in the smaller geographic area.

$$\frac{\textbf{WRA in geographic area of interest}}{\textbf{WRA in state}} = \frac{\textbf{Pregnant in geographic area of interest}}{\textbf{Pregnant in state}}$$

In 2021, there were 2,546,657 WRA in Georgia and 19,682 WRA in Barrow County, GA.[7] With this information a proportion can be applied to calculate the approximate number of pregnant women in Barrow County at a point-in-time in 2021.

$$\frac{19{,}682\ \text{WRA in Barrow County}}{2{,}546{,}657\ \text{WRA in Georgia}} = \frac{\text{Number Pregnant in Barrow County}}{102{,}446\ \text{Pregnant in Georgia}}$$

$$\text{Number Pregnant in Barrow County} = \frac{19{,}682\ * 102{,}446}{2{,}546{,}657} = 792$$

In 2021, approximately 792 women were pregnant at any point-in-time in Barrow County, GA.

Example 3 – Converting a rate to a number

In the District of Columbia, the 2021 fertility rate was 48.7 per 1,000 women aged 15-44.[8] There were 183,286 women aged 15-44 in the District of Columbia in 2021.[9] Equation two was applied.

$$\frac{183{,}286 * 48.7}{1{,}000} = 8{,}926$$

In 2021, there were approximately 8,926 live births in the District of Columbia.

References

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Appendix

This appendix describes the data sources and methods used to create constants for equation one.

Estimating early losses from live births

Information regarding early pregnancy losses before 20 weeks gestation, including ectopic pregnancies and miscarriages, is challenging to obtain as these outcomes are not required to be reported and many early losses occur before awareness of the pregnancy, biasing reported estimates. Therefore, we suggest estimating the number of early pregnancy losses by multiplying the number of live births by 0.26.

The ratio 0.26 was determined using data from the National Survey of Family Growth (NSFG), a survey designed to be nationally representative of individuals aged 15-49 living in households in the United States. Utilizing the 2017-2019 NSFG female pregnancy file, we limited our sample to pregnancy outcomes occurring in the United States from 2012 through 2016 to women 15-49, excluding foreign residents. We then divided the weighted frequency of miscarriages and ectopic pregnancies by the weighted frequency of live births obtaining the ratio of 0.26. This calculation required the use of the restricted NSFG variables CMSTRUS (century month date when non-US-born respondent came to the United States to stay) and INDATEND (century month date pregnancy ended), accessible through the Centers for Disease Control and Prevention's Research Data Center.

Median length of each pregnancy outcome

To determine the proportion of the year (52-weeks) a woman is pregnant for each pregnancy outcome, the median length of each pregnancy outcome was obtained and divided by 52.

Live births

Using the obstetric estimate from the NCHS Public Use Natality data on US births from 2014-2018 among women aged 15-49, excluding foreign residents, the median length of a live birth was 39 weeks. The corresponding proportion of year for live births is 0.75.

Induced abortions & early losses

Limited literature is available describing the median or average gestational length of pregnancies ending in an induced abortion or early pregnancy loss (<20 weeks gestation). Rather, most reports include ranges of when these outcomes typically occur. Therefore, we utilized the 2017-2019 NSFG female pregnancy file, pregnancy outcomes of induced abortion or an early loss (i.e., ectopic pregnancy or miscarriage) occurring in the United States from 2012 through 2016 to women 15-49, excluding foreign residents. The median length of a pregnancy ending in an induced abortion reported in NSFG was 6.3 weeks or 0.12 proportion of a year. The median length of an early pregnancy loss was 7.5 weeks or 0.14 proportion of a year.

Late losses

Although state requirements vary, most pregnancies ending in a loss at or after 20 weeks gestation are usually issued a fetal death certificate. The median length of a late pregnancy loss was 27 weeks, by weekly obstetric estimate, determined using the NCHS Public Use Fetal Death data on US fetal deaths from 2014-2018 among women aged 15-49, excluding foreign residents, the median length of a late pregnancy loss was 27 weeks. The corresponding proportion of a year for late pregnancy losses is 0.52.

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